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ALGÆ OF MARION COUNTY, INDIANA

A DESCRIPTION OF THIRTY-TWO FORMS

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BOOK REVIEWS

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ALGÆ OF MARION COUNTY, INDIANA

A DESCRIPTION OF THIRTY-TWO FORMS

By C. MERVIN PALMER

Reverend George L. Curtiss, in 1882, published in the Twelfth Report of the State Geologist (Indiana) an article entitled, "Diatoms of the Waters of Indiana." It includes, from Marion county, a list and illustrations of seventy-eight forms. One of these, *Staurastrum asperum*, is considered now as a desmid rather than a diatom. This paper by Curtiss is, apparently, the only one which has been published on the algæ of Marion county in which genera or species are given.

During the past five years, the writer has been spending some time in the study of the algæ. He has, with the help of several students, made and recorded over one thousand identifications, representing about 250 species and 150 genera. It has been difficult to obtain literature giving keys and descriptions of the various types of algæ. So far, however, it has been possible to obtain approximately seventy volumes, as well as a considerable number of reprints, dealing with the algæ, making it possible for fairly accurate identifications to be made.

In this paper there are listed and described thirty-two forms from Marion county, Indiana. Twenty of these were included by the writer in the check list of Indiana Algæ in 1928 (14), but they were not described nor illustrated. In a majority of cases, the forms have been identified soon after they were collected and before being preserved in formalin or formalin-alcohol. Drawings of thirty of the thirty-two algæ are included and may help in making clear the characteristics. The references which have been of greatest benefit in the identification are Pascher's "Die Süßwasserflora Deutschlands, Oesterreichs und der Schweiz," Collins' "Green Algæ of North America," Smith's "Phytoplankton of the Inland Lakes of Wisconsin," Tilden's "Myxophyceæ (Minnesota Algæ)" and West and Fritsch's "British Freshwater Algæ."

Many of the algæ were collected on the Butler University campus. White river forms the west border of the grounds, a canal cuts through the campus, and there are several artificial fountains (one containing sulphur water), several springs and pools from which to collect. The water in one abandoned watering-trough has been red during the spring and fall of 1930, due to the presence of *Hæmatococcus pluvialis*

(*Sphærella lacustris*). One spring has a constant growth of *Vaucheria geminata*; another spring harbors *Batrachospermum*. The flower-pots in the Botany Department greenhouse have been yielding the dark green tufts of *Symploca muralis*.

Recently the writer has been studying the algæ in White river below the Indianapolis Sewage Disposal Plant. Few of these algæ are included in this paper, but special mention should be made of the species, *Schizomeris leibleinii*, which was found in great abundance attached to rocks and amorphous matter in the ripples during September, 1930. This alga has not been reported often for the United States (20).

Thirteen of the thirty-two algæ described have not been reported previously for Indiana by other workers, and three of these thirteen represent new genera for the state. Those which are new for the state are: *Microcoleus paludosus*, *Phormidium uncinatum*, *Symploca muralis*, *Glæocapsa purpurea*, *Closterium lunula*, *Scenedesmus quadricauda*, *Ankistrodesmus falcatus*, *Trachelomonas hispida* var. *cylindrica*, *Spirogyra ellipsospora*, *Pediastrum duplex* var. *clathratum*, *Pleodorina illinoisensis*, *Gonium sociale*, *Pithophora kewensis*, *Vaucheria geminata* var. *racemosa* and *Anabæna cylindrica*.

The information on each of the thirty-two algæ includes the following: Species (or genus or variety) name; previous record for Indiana; date of first collection by the writer, location, habitat, macroscopic appearance; microscopic characteristics of vegetative and of reproductive structures; measurements; and references used.

The algæ described are in the following classified list:

Myxophyceæ (Cyanophyceæ)

Anabæna cylindrica

Calothrix parietina

Glæocapsa purpurea

Merismopedium glaucum

Microcoleus paludosus

Microcystis æruginosa

Oscillatoria limosa

Oscillatoria princeps

Oscillatoria tenuis

Phormidium uncinatum

Symploca muralis

Rhodophyceæ

Batrachospermum

Heterokontæ

Botrydium granulatum

Desmidiaceæ

Closterium lunula

All other algæ (Chlorophyceæ, etc.)

Ankistrodesmus falcatus

Gonium sociale

Hæmatococcus pluvialis

Pediastrum boryanum

Pediastrum duplex var. clathratum

Pithophora kewensis

Pleodorina illinoisensis

Pleurococcus vulgaris

Scenedesmus dimorphus

Scenedesmus obliquus

Scenedesmus quadricauda

Schizomeris leibleinii

Spirogyra ellipsospora

Trachelomonas hispida var. cylindrica

Ulothrix zonata

Vaucheria geminata

Vaucheria geminata var. racemosa

Vaucheria sessilis

ANABÆNA CYLINDRICA Lemm.

Species not previously reported for Indiana.

April 25, 1930. In aquarium in greenhouse, Jordan Hall, Butler University. Floating with Oscillatoria and other material. The small masses of Anabæna were generally hidden under the Oscillatoria. They were dark green in color, slimy, and appearing somewhat like an irregular Nostoc bead.



Trichomes parallel; each trichome straight, even when not surrounded by others. Vegetative cells quadrate rather than spherical, the length about the same as the diameter. No granules present in the vegetative cells. Protoplasts light blue-green in color. Terminal cells cone-shaped. Resting cells (gonidia)

short cylindrical with rounded corners. When mature they have a clear, colorless, thick, smooth wall. Resting cells are located on both sides of the heterocysts; they are commonly single, but occasionally contiguous. Protoplasm green and with large granules. Heterocysts spherical to oval, with disc-shaped plugs.

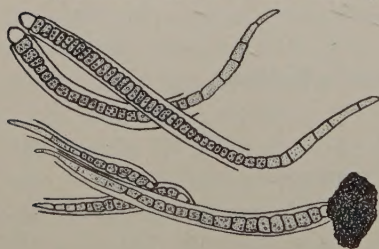
Vegetative cell, diameter, 4.1 microns; length, from 3.6 to 5.4 microns. *Resting cell* (gonidium), diameter, from 5.4 to 7.2 microns; length, from 9 to 14 microns. *Heterocyst*, diameter, 5.4 microns; length, 5.4 microns.

Reference: Pascher, 1925, Heft 12.

CALOTHRIX PARIETINA (Nægeli) Thuret

Species previously reported for Indiana in 1908 (3) for Monroe county.

September 21, 1928. As dark green, thin coating on wet part of iron drinking fountain, Butler University campus. Water in the fountain contains sulphur.



Vegetative cells blue-green. Sheath colorless to yellowish-brown. Trichomes tapering. Heterocysts terminal.

Filament, diameter near heterocyst, 12 microns. *Heterocyst*, diameter, 8.4 microns.

Reference: Tilden, 1910.

GLÆOCAPSA PURPUREA Kützing

Species not previously reported for Indiana.

May 10, 1930. In pool in an old unroofed greenhouse on Butler University campus. Forming a thin, slimy, vivid purple layer on the surface of a thick algal mat, just below the water surface.



Cells clustered in irregular groups. Light purple color of cells seen under microscope when the cells are in clusters, but scarcely evident when cells are separated. Individual protoplasts apparently spherical, surrounded by an almost colorless sheath. Protoplasts purple or sometimes greenish-purple. Cells vary in

size in different clusters although in any one cluster they have a uniform size.

Protoplast, diameter, from 1 to 2.5 microns; plus sheath, diameter, from 2 to 5 microns.

Reference: Pascher (Geitler), 1925, Heft 12.

MERISMOPEDIUM GLAUCUM (Ehrenberg) Nægeli

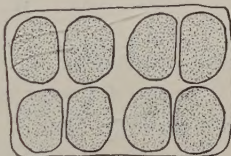
Species previously reported for Indiana in 1909 (1) for Monroe county and in 1920 (9) for Marshall county.

October 9, 1928. Under concrete bridge over White river at Michigan road. Mixed with *Spirogyra* and other filamentous algæ.

Vegetative cells spherical or oval, surrounded by a gelatinous sheath. Cells regularly arranged, forming a single layer.

Vegetative cell, diameter, 3 to 6 microns.
Colony, length and width, less than 45 microns.

Reference: Tilden, 1910.



MICROCOLEUS PALUDOSUS (Kützing) Gomont

Genus not previously reported for Indiana.

January 4, 1929. On damp soil in botany greenhouse, Jordan Hall, Butler University. Plant mass dull dark green.

Sheaths lamellose, transparent; each sheath inclosing many tri-



chomes. End cell of trichome tapering to a point; trichomes not capitate and not constricted at the joints. Cells blue-green in color, with scattered dark granules.

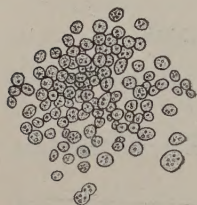
Filament (trichomes plus sheath), diameter, variable, one specimen 48 microns; length, variable, one specimen 2080 microns. *Trichome*, diameter, 4.8 to 5.5 microns. *Cell*, length, up to 12 microns.

References: Collins, 1918; Tilden, 1910.

MICROCYSTIS ÆRUGINOSA Kützing

Species previously reported for Indiana in 1920 (9) for Kosciusko county and Marshall county.

October 11, 1928. In outdoor pool at State Fish Hatchery, Indianapolis, at bottom of a fall of water coming from a pipe extending to another pool. Colonies were on surface of water, mixed with air bubbles.



Cells in colonies, which are macroscopic and very irregular in shape. Sheath present but not clearly visible. Vegetative cells light blue-green; pseudo-vacuoles present. No red pigment observed in the cells.

Colony, diameter, about 600 microns. *Vegetative cell*, diameter, 2.5 to 4 microns.

References: Tilden, 1910; Smith, 1920.

OSCILLATORIA LIMOSA Agardh.

Species previously reported for Indiana in 1908 (3) and 1909 (1) for Monroe county.

October 12, 1928. On surface of wet soil in greenhouse, East Forty-sixth street, Indianapolis.



Trichomes straight; not constricted at the joints; apex not tapering.

Cells brownish olive-green; end wall granulated.

Filament, diameter, 18 microns. *Vegetative cell*, length, commonly 2.4 microns; range from 2 to 5 microns.

References: Collins, 1918; Tilden, 1910.

OSCILLATORIA PRINCEPS Vaucher

Species previously reported for Indiana in 1908 (3) and 1909 (1) for Monroe county.

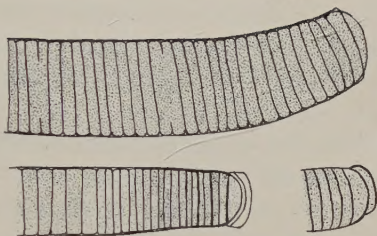
October, 1928, and October, 1929. In outdoor pool at State Fish

Hatchery. Mass dark green in color, floating.

Vegetative cells dark grass-green. Filaments show oscillating and progressive movements. Transverse walls not granulated; most of granules in the cells are small. Filaments somewhat capitate, straight, not constricted at the joints. Well-developed caps not common; caps brown in color.

Filament, diameter, 38.5 to 43 microns. *Cell*, length, 3.5 to 7 microns.

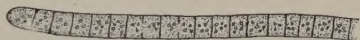
Reference: Tilden, 1910.



OSCILLATORIA TENUIS Agardh.

Species previously reported for Indiana in 1908 (3) and 1909 (1) for Monroe county, and in 1920 (9) for Marshall county.

October 19, 1928. In rain pools back of Jordan Hall, Butler University, growing on wet earth at and above the water line. Plant mass grass-green in color, dense.



Trichomes not constricted at the joints and without two rows of granules along the transverse walls. Granules present but located in the center of each cell. Cells light blue-green in color.

Trichome, diameter, 6 microns. *Vegetative cell*, length, commonly 4.2 microns; range from 3.6 to 6 microns.

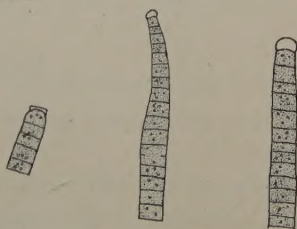
References: Collins, 1918; Tilden, 1910.

PHORMIDIUM UNCINATUM (Agardh.) Gomont

Species not previously reported for Indiana.

November 23, 1929. In canal on Butler University campus and in the same canal a short distance north of the campus. Growing as a grass-green mat on the surface of submerged soil at edge of canal. Mat easily separable from the soil.

Cells are in filaments which have progressive, but not oscillatory movements. Filaments capitate. Broken ends of filaments show the torn sheath; the part of the sheath which protrudes is of shorter



diameter than the part around the trichome. Filaments tapering and slightly curved at the tips. Cell contents blue-green in color. Cells not constricted at the joints. Granules present. Cap on filament is prominent, enlarged, bulbous.

Filament, diameter, 6 to 7 microns. *Cell*, length, 3.5 to 5.4 microns.

Reference: Tilden, 1910.

SYMPLOCA MURALIS Kützing

Genus not previously reported for Indiana.

December 15, 1929, and continually since then. On moist soil in greenhouse, Jordan Hall, Butler University. Plant mass resembling a



group of miniature dark green Indian tents connected together with a mat of the same color on the surface of the substratum. The cone-shaped fascicles can be seen easily with the naked eye.



Cells in filaments, each filament being inclosed in a sheath. Sheath colorless, extending about the length of one cell beyond the broken end of the trichome. Trichomes not constricted at the joints. Apex of trichome slightly tapering. Cells light olive-green to blue-green in color; scattered granules present.

Fascicle, length, about 1 mm. *Trichome*, diameter, .3 to 3.6 microns. *Cell*, length, 3.5 to 4.7 microns.

References: Tilden, 1910; West and Fritsch, 1927.

BATRACHOSPERMUM sp.

Batrachospermum moniliforme was reported in 1909 (1) for Monroe county.

February 27, 1930, and later during the spring and fall of the same year. Attached to brick wall, about one foot below the surface of the

water in a spring on Butler University campus. The plants were not numerous but were conspicuous due to their large size. Plant mass gelatinous, varying in color from a bright grass-green to a dull brownish green.

Filamentous, branching, the branches in regularly spaced tufts which are dense and tend to be spherical. Main axes and branches tapering and terminating in long colorless hairs. Plants inclosed in thick gelatinous envelopes. In this sheath, during the spring, were numerous small green cells which may have been the spermatia. No female sex organs were observed from specimens taken several times during the spring and thus no accurate identification to species could be made.

Plant, length, about 2 cm. (maximum).

References: Pascher, 1925, Heft 11; West and Fritsch, 1927; Hylander, 1928.

BOTRYDIUM GRANULATUM (L.) Greville

Species previously reported for Indiana in 1909 (1) for Monroe county and in 1920 (9) for Marshall county.

September 21, 1928. Growing in clusters in clay mud along canal in Butler University campus.

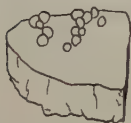
The substratum was just above the level of the water. The form has not been seen in this locality

by the writer since the above date, although close watch has been kept for it, especially at the place where it was first found.

Portion above ground is bulbous; green in color. Portion extending into the soil from the bulb is tubular, branching colorless. Diameter of the tube gradually decreases from just below the bulb to the ends of the branches. Change in color and diameter from bulb to rhizoid is gradual.

Bulb, height, about 1 mm.

References: Collins, 1909; West and Fritsch, 1927.



CLOSTERIUM LUNULA (Müll.) Nitzsch. forma MINOR

Species not previously reported for Indiana.

May 10, 1930. In a pool in an old unroofed greenhouse on Butler University campus. The cells were held in strands of mucilage which



were attached at one end to objects in the bottom of the pool and extended up to the water surface. These strands were, in some cases, six inches long. They were fragile, and could not be picked up out of the water ex-

cept by drawing them into a pipette.

Plastids with twelve radiating plates. Vacuole at each end of the cell, and containing particles showing Brownian movement. Many cells in the process of vegetative division were observed.

Cell, diameter at widest point, 60 microns; diameter at point between terminal vacuole and plastid, 12 microns; length (air line), from 250 to 550 microns.

Reference: West, 1904

NOTE: No mention of cells of *Closterium* species being in strands of mucilage was found, but the size and shape of the individual cells of this material fit the description of *Closterium lunula* best.

ANKISTRODESMUS FALCATUS (Corda) Ralfs

Species not previously reported for Indiana.

October 4, 1928. In pool fed in part by a sulphur spring, Butler University campus. Not abundant.



Cells elongated, pointed at ends, curved (and sometimes twisted at the ends) to form "S" and "U" shapes. Cells observed were not clustered.

Cell, "U" shaped, length (air line), 13.2 microns; diameter at mid-point, 2.5 microns. *Cell*, "S" shaped, length (air line), 15.6 microns; diameter at mid-point, 1.2 microns.

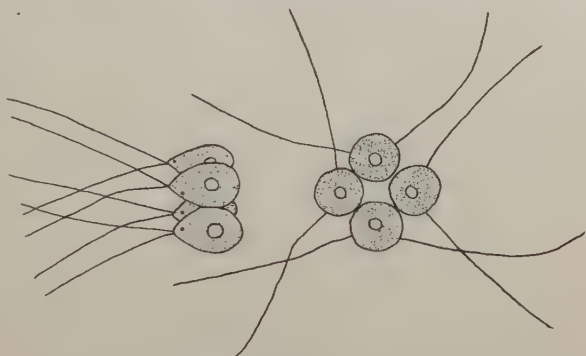
References: Collins, 1909 (See under *Raphidium*); West and Fritsch, 1927.

GONIUM SOCIALE (Duj.) Warming

Species not previously reported for Indiana.

November 8, 1928. In water in small tin can, State Fish Hatchery grounds. Mixed with *Scenedesmus* and abundant *Pleodorina*. Not very abundant.

Cœnobia all of four cells, forming a plate. Cells pear-shaped, each with two cilia; the part of the cilium nearest the cell does not vibrate. Cilia are two to three times the length of the



cell. Red "eye spots," one per cell. Cells touching one another at their widest diameter. No gelatinous envelope is apparent.

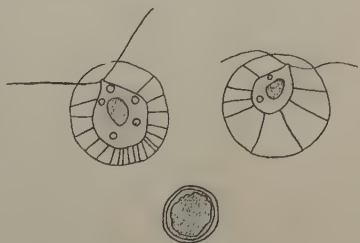
Colony, diameter, 15 microns. *Cell*, diameter, 7 microns; length, 10 microns.

References: Collins, 1909 and 1918; West and Fritsch, 1927; Pascher, 1927, Heft 4.

HÆMATOCOCCUS PLUVIALIS Flotow (*Sphærella lacustris* Hazen)

Species previously reported for Indiana in 1909 (1) for Monroe county (as *Sphærella pluvialis*).

May 2, 1930. Cysts of this form were obtained from the same place in November, 1930. In unused concrete drinking trough, Butler University campus. The trough contained rain water which had a distinct reddish color due to an abundance of this organism. The bottom and sides of the container were red due to a coating of cysts of the organism. The trough was dry during part of the preceding winter. It was again dry during most of the summer 1930,



but, as stated above, the rain water present in November in the trough had a red color due to presence of the organism.

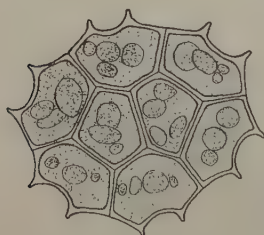
Vegetative cells were motile by means of two cilia, seen without staining. These cells contained a large bright red central stigma surrounded by the chloroplast. The beak of the protoplast at the base of the cilia is colorless. The protoplast is surrounded by a thick, colorless, transparent wall with protoplasmic threads radiating through it. The vegetative cells were spherical at the outer margin but had a pear-shaped protoplast. The cilia extended from the beak of the protoplast through the wall into the water. The protoplast was generally in the center of the cell, but in a few specimens was located close to one side. The cysts were spherical, with a bright red spherical protoplast. No green pigment is seen in the cyst. The medium thick wall is a light brown color.

Vegetative cell, length, from 30 to 66 microns; width, from 30 to 66 microns; length of protoplast, from 15 to 39 microns; width of protoplast, from 15 to 29 microns; length of stigma, from 10 to 20 microns; width of stigma, from 8 to 11 microns; length of cilia, about 18 microns. *Cyst*, variable in size. One measured 26.4 microns in diameter, with a wall 2 microns thick.

References: Pascher, 1927, Heft 4; Engler and Prantl, 1927; Collins, 1909; Hazen, 1899; West and Fritsch, 1927.

PEDIASTRUM BORYANUM (Turp.) Meneghini

Species previously reported for Indiana in 1891 (13) for Lake county, in 1908 (3) and 1909 (1) for Monroe county, in 1909 (16) for Lawrence county, and in 1920 (9) for Marshall county.



October 11, 1928. In pond at State Fish Hatchery, Indianapolis. Mixed with *Spirogyra*, *Scenedesmus* and other forms.

Colony a flat plate of eight cells. Marginal cells each with two short parallel projections. Cells olive-green in color.

Cell, approximate diameter, 9.6 microns.

References: Collins, 1909 and 1918; Smith, 1920.

PEDIASTRUM DUPLEX Meyen var. CLATHRATUM (A. Braun) Lagerheim

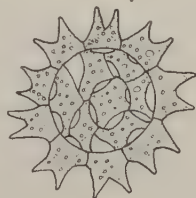
Species previously reported for Indiana in 1920 (9) for Marshall county. The variety has not been reported previously for Indiana.

November 6, 1928. In pool fed in part by a spring containing sulphur water, Butler University campus. Not abundant.

Cœnobium perforate, of sixteen cells, nine of which are marginal. Cells on margin have two truncate projections.

Colony, diameter, 52 microns. Cell, diameter, about 10 microns.

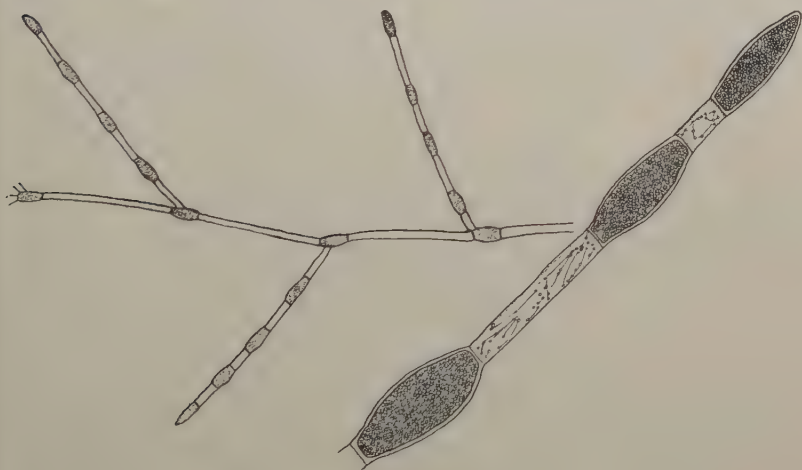
Reference: Smith, 1920.



PITHOPHORA KEWENSIS Wittrock

Genus not previously reported for Indiana.

November 10, 1929. Found in abundance, floating in water in a covered pint jar which had been in the laboratory, Butler University, by



a north window, since July, 1929. The jar, in July, contained conjugating Zygnema and no Pithophora was observed at that time.

Vegetative cells in branching filaments, with prominent dark green plastid, or almost colorless. Main filaments of about the same diameter as the branches. Reproductive cells (akinetes) somewhat swollen, dark grass-green in color, generally alternating with the vegetative cells.

Vegetative cell, diameter, from 50 to 75 microns; length, from 200

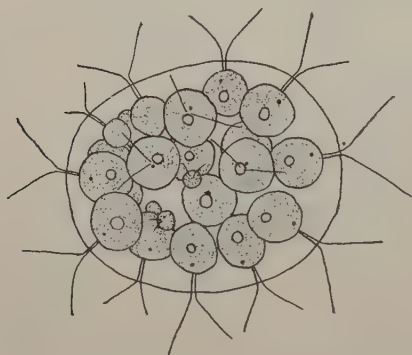
to 1400 microns. *Akinete*, diameter, from 80 to 98 microns; length, from 150 to 310 microns.

References: Collins, 1912; Pascher, 1921, Heft 7.

PLEODORINA ILLINOISENSIS Kofoid

Species not previously reported for Indiana.

November 8, 1928. In small can of water at the grounds of the State Fish Hatchery. Mixed with *Gonium* and *Scenedesmus*. Very abundant in the sample obtained.



Cænobia composed of thirty-two cells (four vegetative and twenty-eight gonidial cells). Two cilia per cell. Cænobium a sphere or sub-sphere with cells arranged near the periphery. In most of the colonies the vegetative cells were localized. Daughter cænobia were present in many of the larger colonies.

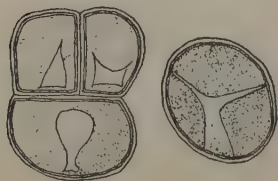
Cænobium, diameter, commonly 72 microns, range from 18 to 180 microns. *Gonidial cell*, diameter, commonly about 12 microns, range from 6 to 22.8 microns. *Vegetative cell*, diameter, commonly about 6 microns.

References: Collins, 1909 and 1918; West and Fritsch, 1927.

PLEUROCOCCUS VULGARIS Meneghini

Species previously reported for Indiana in 1908 (3) for Monroe county.

September 21, 1928. As thin green layer on trunk of catalpa tree, northwest side, Butler University campus. Very common and abundant.



Cells solitary, in small regular packets, or in larger irregular groups. Wall, when between two protoplasts, is straight. One parietal chloroplast per cell. No pyrenoids evident even after addition of iodine.

Cell, diameter from 4.8 to 10.8 microns.

References: Collins, 1909; West and Fritsch, 1927.

SCENEDESMUS DIMORPHUS (Turpin) Kützing

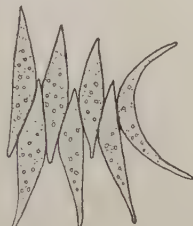
Species previously reported for Indiana in 1891 (13) for Lake county and in 1909 (1) for Monroe county.

November 6, 1928. In pool fed in part by sulphur spring. Butler University campus. Not abundant.

Eight (or seven) cells per colony. Terminal cells lunate, other cells elliptical. All cells with tapering, pointed ends. Granules several per protoplast.

Cell, diameter at widest part, 6 microns; length, 25 microns. *Colony* (of seven cells), length, 29.2 microns.

Reference: Smith, 1920.



SCENEDESMUS OBLIQUUS (Turpin) Kützing

Species previously reported for Indiana in 1920 (9) for Marshall county.

October 25, 1928. In water in drinking trough, Butler University campus near the botanical garden. Mixed with other species of Scenedesmus and other algæ. Fairly abundant.

Cells in groups of four, light green (almost blue-green) in color; ends acute.

Cell, width, 2.4 microns; length, 10.8 microns. *Colony*, 9.8 microns by 10.8 microns. Some colonies contained cells which were 4.8 microns wide and the ends of the cells were not as sharp pointed. The width of these cells was the same as for those in the other colonies, 10.8 microns. These larger colonies were at first classified as *S. bijuga*.

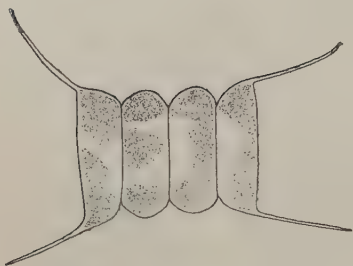
Reference: Collins, 1909.



SCENEDESMUS QUADRICAUDA (Turpin) Brebisson

Species not previously reported for Indiana.

October 3, 1928. In pool fed partly by a sulphur spring, Butler University campus.



Cells in colonies of four, attached laterally. A long, pointed, colorless projection extending from each end of each terminal cell. Cells are somewhat larger than for species as recorded in Collins, 1909.

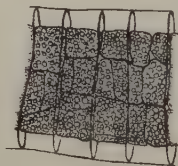
Cell, length 15.6 microns; width, 4 microns. *Colony*, 16.2 by 15.6 microns.

References: Collins, 1909; Smith, 1920.

SCHIZOMERIS LEIBLEINII Kützing

Species previously reported for Indiana in 1920 (9) for Marshall county.

February 15, 1930. In small aquarium in laboratory, Butler University. *Ædogonium* from a fish bowl had been placed in the aquarium during the previous summer. In February, the *Schizomeris* was found mixed with young *Ædogonium* fila-



ments and some *Ulothrix*. The *Ulothrix* cells were different in size and in thickness of wall from the basal cells of *Schizomeris*. In September, 1930, *Schizomeris leibleinii* was found in White river just below Indianapolis. It was attached to sewage sludge in a small rapid.

Individual filaments visible to the naked eye and appearing as short and thick; attached to the side of the aquarium near the water level. Wall of trichome thick. Septa prominent, some of them not reaching to the outside wall. Filaments gradually tapering to the base. The plant body is one cell wide at the base and increases to three or four cells in width in the wider portions. Constrictions in the filament occur at infrequent and irregular intervals. Chloroplasts in the parenchymatous part apparently filling the cells and dark grass-green in color. Chloroplasts in the part forming a simple filament are like those in *Ulothrix*. Pyrenoids not observed.

Filament, diameter, up to 86.4 microns; diameter at base, 18 microns.

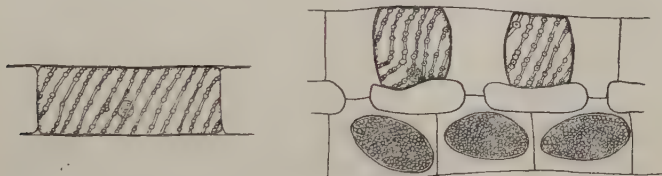
Cell, length, in basal portion of filament, 7.2 microns; diameter in parenchymatous portion, 7.2 to 13.2 microns.

References: Pascher, 1914, Heft 6; Watson and Tilden, 1930; Collins, 1909.

SPIROGYRA ELLIPSOSPORA Transeau

Species not previously reported for Indiana.

May 30, 1927. In shallow water of bog known as "Bacon's Swamp." Considerable quantities of this alga were collected at the time it was observed in 1927, but it has not been seen there since.



Filaments long and of very large diameter. Vegetative cells with considerable variation in length. Zygotes ellipsoid, sometimes lying diagonally in the cells. Plastids in vegetative filaments, six per cell.

Vegetative cell, length, from 150.8 to 416 microns; diameter, 166 microns. *Zygote*, length, 140 to 218 microns; diameter, 125 to 151 microns. Sizes of individual zygotes: 132 by 218.4, 150.8 by 189.8, 124.8 by 140.4, and 124.8 by 176.8 microns.

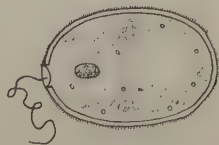
References: Collins, 1909; Collins, 1918 (second supplement).

TRACHELOMONAS HISPIDA (Perty) var. CYLINDRICA Klebs

Species not previously reported for Indiana.

October 29, 1928. In black mud in spring on Butler University campus, near canal north of bridge.

Cell cylindrical with broadly rounded ends. Protoplast surrounded by an envelope which is thickly covered with straight short spines. Organism motile by means of a flagellum which passes through a large pore in the cell envelope.



Cell (plus envelope), diameter, 17 to 18 microns; length, 27.5 to 30 microns.

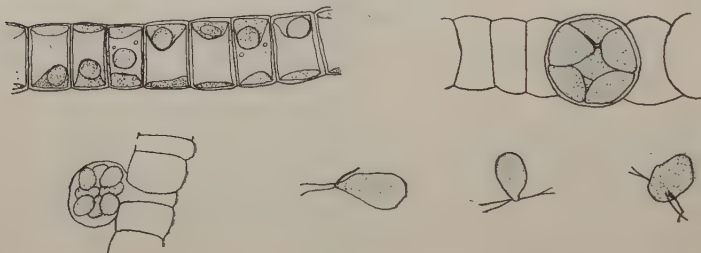
Reference: Walton, 1915.

ULOTHRIX ZONATA (Web. and Mohr) Kützing

Species previously reported for Indiana in 1920 (9) for Marshall county, and in 1926 (2) for Monroe county.

March 5, 1930. In spring on Butler University campus. Filaments attached to submerged upright wooden post. Filaments short but fairly abundant.

Many threads were composed almost entirely of empty sporangia.



Other filaments contained vegetative cells, young zoosporangia, mature zoosporangia containing eight zoospores, and zoosporangia in the act of releasing zoospores. Vegetative cells with one plastid each, the plastid being an incomplete parietal band with one large pyrenoid. The macrozoospores were green in color with a red pigment spot near the anterior end. The use of a special stain showed four cilia to be present on the anterior end.

Vegetative cell, diameter, from 19.2 to 27.6 microns; length, from 9.6 to 16.8 microns. *Zoospore*, diameter, from 7.2 to 9 microns; length, from 9.6 to 13.2 microns. *Cilium*, length, from 6 to 10 microns.

References: Collins, 1909; Smith, 1920; Hazen, 1902.

VAUCHERIA GEMINATA (Vauch.) DeCandolle

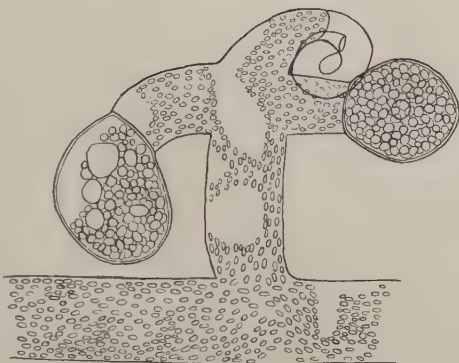
Species previously reported for Indiana in 1908 (3) and 1909 (1) for Monroe county.

October 25, 1928. In quiet water in pool south of Irvington. Mixed with *V. sessilis*.

Oogonia on branches, stipitate, usually two per branch. Antheridia hooked, usually surpassing the oogonia in length. Sexual branch short.

Vegetative filament, diameter, 58 to 60 microns. *Oogonium*, diameter, 67 to 74 microns; length, 70 to 89 microns. *Antheridium*, diameter, 18 to 24 microns.

Reference: Collins, 1909.



VAUCHERIA GEMINATA (Vauch.) DeCandolle var. RACEMOSA
(Vauch.) Walz

Variety not previously reported for Indiana.

February 27, 1930. In a spring on Butler University campus. Vegetative Vaucheria had been collected from the spring for several months previous to the finding of the reproductive material in February.

Reproductive branches with one terminal antheridium, projecting beyond the six oogonia. Each oogonium beaked at the top and with short stipe. Chloroplasts in the vegetative part of the plant are elongated and tapering at the ends.

Vegetative filament, diameter, 94 microns. *Oogonium*, diameter, 62.5 microns; length, 74.5 microns.

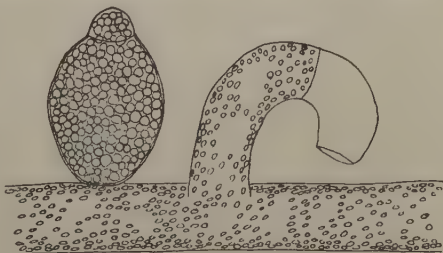
References: Collins, 1909; Pascher, 1921, Heft 7.

VAUCHERIA SESSILIS (Vauch.) DeCandolle

Species previously reported for Indiana in 1908 (3) and 1909 (1) for Monroe county.

October 25, 1928. In quiet water in pool south of Irvington. Mixed with *V. geminata*.

Oogonia sessile on the main filament. Antheridia hooked. Beak of the oogonium is terminal. The specimen was intermediate between *V. repens* and *V. sessilis*, but fits the latter best especially as



to habitat, maximum diameter of the vegetative filament, length of oogonium and the location of the beak.

Vegetative filament, diameter, from 42 to 60 microns. *Oogonium*, length with beak, 92 microns (beak, length, 8 microns); diameter, commonly 55.2 microns, but ranges from 54 to 81 microns. *Antheridium*, length, 54 microns.

References: Collins, 1909; West and Fritsch, 1927.

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BOOK REVIEWS

HORTICULTURE

In "Hortus"¹ Bailey has collected an unprecedented amount of horticultural information in one volume. Soil, climate and moisture requirements; cultural and propagation methods; botanical origin and relationship; varietal selection and regional adaptation; insect and disease resistance and control; marketing and transfer methods; and other valuable information is given for every group of plants known to be in cultivation in the United States and Canada. The volume is in no sense an abridgement of Dr. Bailey's earlier *Standard Cyclopedia of Horticulture*, but rather it is an entirely new undertaking from fresh and original sources and may be considered as an up-to-date supplement to the larger earlier work. Technical botanists will find a very instructive discussion on nomenclature in the preface.—R. C. F.

CACTI

In "The Cactus Book," Arthur D. Houghton² has prepared for the amateur and layman a discussion of the propagation, culture, care and requirements of the cacti. Their evolution by hybridization, their mutation by x-rays, their use in rock gardens and landscaping, and the acquisition of collections are discussed. A conspectus of species at the close of the volume comprises the most valuable part of the work for the scientist.—R. C. F.

MODERN SCIENCE

From the making of worlds to the intricate workings of the human mind and society, J. Arthur Thomson³, in "Modern Science," leads his fascinated readers through a wealth of scientific lore which holds the interest and grips the imagination of both scientist and layman alike. Although the material is frankly simplified, there is no touch of pseudoscience and no effort is made to "popularize" science. There is a decided strain of philosophical humor throughout the book, an unusual thing in

¹BAILEY, L. H., and ETHEL ZOE BAILEY. *Hortus: A Concise Dictionary of Gardening and General Horticulture*. pp. 652, fig. 22, pl. 16. New York: The Macmillan Co. 1930.

²HOUGHTON, ARTHUR D. *The Cactus Book*. pp. xii, 147; pl. 12. New York: The Macmillan Co. 1930.

³THOMSON, J. ARTHUR. *Modern Science*. pp. xii, 370; pl. vi, fig. 29. New York: G. P. Putnam's Sons. 1930.

a scientific publication, but the book gains much in interest and loses none of its scientific standing because of it.—R. C. F.

GENERAL ELEMENTARY BOTANY

We have received recently a copy of the revised edition of the general botany text by Professor Elmer Campbell⁴, and find many improvements in drawings and arrangement over the first edition, but are disappointed that not more drawings were replaced with better ones. The chapters on the taxonomy of the seed plants is more than adequate for many general botany courses, while the information on the lower plants deals with a considerable number of plants but gives little in detailed accounts of individual forms. That the author's "fine art of accurate verbal expression of botanical thought," see page vii, is different from that of other writers of general botany texts, is indicated in the following quotation, page 62: "In certain seasons of the year the most conspicuous object in all nature is the thing known as a leaf. In the springtime, young and tender, it appears and is hailed as the prophet of a new season; in summertime it is sought as a protection from the burning rays of the noonday sun; in the fall as it ripens it inserts a thousand hues into a glorious landscape."—C. M. P.

MORPHOLOGY AND PHYSIOLOGY

College teachers of botany will welcome the present revision of the well-known Coulter, Barnes and Cowles' texts⁵. The most important changes in Volume 1 noted by the reviewer are those in the text and figures dealing with rusts, this bringing them into agreement with more recent discoveries. It is to be regretted that the very recent discoveries concerning pycniospores came too late to be included. It seems unfortunate, too, that the chapter on "Organic Evolution" was not "modernized." A valuable addition is the classified list of references given under the heading "General Literature."—R. C. F.

Volume 2, on physiology, has been brought up to date by Dr. C. A. Shull, professor of physiology at the University of Chicago, without sacrificing the spirit and organization of the subject so admirably pre-

⁴CAMPBELL, ELMER. General Elementary Botany with Practical Applications. Revised edition. pp. xiii, 410, figs. 251. New York: Thomas Y. Crowell Company. 1930.

⁵COULTER, JOHN M., CHARLES R. BARNES and HENRY C. COWLES. A Textbook of Botany for Colleges and Universities. Vol. 1, Morphology, pp. viii, 310; fig. 619. Vol. 2, Physiology pp. viii, 307; fig. 87. New York: American Book Co. 1930.

sented by Dr. Barnes. The rapid strides made by the science of plant physiology in recent years makes this revision seem like a new book despite the fact that much of the text remains practically as written in the first edition. Abundant practical references to the literature enhance the value to both teacher and student. Space has not permitted the inclusion of more experimental data illustrative of the subjects discussed, yet the small size of the volume belies the actual content, which is adequate. This book compares most favorably with other recent plant physiologies.—S. A. C.

Volume 3, on ecology has been revised by Professor George D. Fuller and will appear soon.

EXPLORING FOR PLANTS

The romantic adventures of a scientist in search of new plants for introduction into our own country are vividly portrayed in David Fairchild's⁶ recent book, "Exploring for Plants." The accounts of the friendly cooperation of foreign botanists in the collecting of seeds and living plants for experimental purposes give the reader an understanding of the true fellowship existing among people of various nations who are working in a common cause. An intimate glimpse into the personal experiences of Dr. Fairchild with his family and assistants during their travels in West Africa, the East Indies and other countries, makes the book of much interest to the nonscientific reader, while there is sufficient scientific data to hold the attention of the botanist. The author frankly strives to show his readers that there is true romance in the study of plants, and in this he succeeds.—M. M. E.

⁶FAIRCHILD, DAVID. Exploring for Plants. pp. xx, 591; figs. 190. New York: The Macmillan Co. 1930.